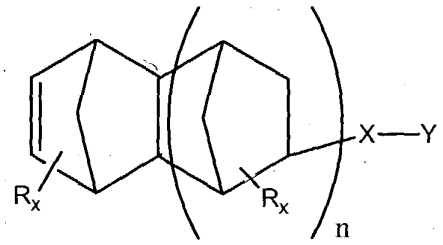
WHAT IS CLAIMED IS:

1. A heterobifunctional monomer of the following structure:



wherein:

each R is independently lower alkyl, -Br, or -I,

X is a covalent bond or a bridging group containing more than one carbon atom,

Y is a maleimide, a nadimide, an itaconimide, an epoxy, a cyanate ester-substituted aryl, a propargyl-substituted aryl, an ethynyl-substituted aryl, a (meth)acrylate, an unsaturated anhydride, a vinyl ether, a vinyl ester, a divinyl compound, an allyl amide, a styrene, an oxazoline, or a benzoxazine,

n is 0 to about 8, and

each x is independently 0, 1, or 2.

2. The heterobifunctional monomer according to claim 1, wherein X is a polyvalent radical selected from the group consisting of hydrocarbylene, substituted hydrocarbylene, heteroatom-containing hydrocarbylene, substituted heteroatom-containing hydrocarbylene, polysiloxane, polysiloxane-polyurethane block copolymer, and combinations of two or more thereof, optionally containing one or more linkers selected from the group consisting of a covalent bond, -O-, -S-, -NR-, -O-C(O)-, -O-C(O)-O-, -O-C(O)-NR-, -NR-C(O)-, -NR-C(O)-O-, -NR-C(O)-NR-, -S-C(O)-,

-S-C(O)-O-, -S-C(O)-NR-, -S(O)-, -$S(O)_2$-, -O-$S(O)_2$-, -O-$S(O)_2$-O-, -O-$S(O)_2$-NR-, -O-S(O)-, -O-S(O)-O-, -O-S(O)-NR-, -O-NR-C(O)-, -O-NR-C(O)-O-, -O-NR-C(O)-NR-, -NR-O-C(O)-, -NR-O-C(O)-O-, -NR-O-C(O)-NR-, -O-NR-C(S)-, -O-NR-C(S)-O-, -O-NR-C(S)-NR-, -NR-O-C(S)-, -NR-O-C(S)-O-, -NR-O-C(S)-NR-, -O-C(S)-, -O-C(S)-O-, -O-C(S)-NR-, -NR-C(S)-, -NR-C(S)-O-, -NR-C(S)-NR-, -S-$S(O)_2$-, -S-$S(O)_2$-O-, -S-$S(O)_2$-NR-, -NR-O-S(O)-, -NR-O-S(O)-O-, -NR-O-S(O)-NR-, -NR-O-$S(O)_2$-, -NR-O-$S(O)_2$-O-, -NR-O-$S(O)_2$-NR-, -O-NR-S(O)-, -O-NR-S(O)-O-, -O-NR-S(O)-NR-, -O-NR-$S(O)_2$-O-, -O-NR-$S(O)_2$-NR-, -O-NR-$S(O)_2$-, -O-$P(O)R_2$-, -S-$P(O)R_2$-, -NR-$P(O)R_2$-, wherein each R is independently hydrogen, alkyl or substituted alkyl, and combinations of any two or more thereof.

3. The heterobifunctional monomer according to claim 1, wherein X is alkylene or oxy-alkylene comprising from 2 up to about 20 carbon atoms, arylene, or siloxane.

4. The heterobifunctional monomer according to claim 3, wherein X is alkylene comprising from 2 up to about 20 carbon atoms.

5. The heterobifunctional monomer according to claim 4, wherein the alkylene is C_2 to C_6 alkylene.

6. The heterobifunctional monomer according to claim 1, wherein Y is a maleimide, a nadimide, or an itaconimide.

7. The heterobifunctional monomer according to claim 1, wherein Y is a nadimide.

8. The heterobifunctional monomer according to claim 7, wherein the nadimide is substituted with 1 or 2 independently selected lower alkyl, -Br, or –I.

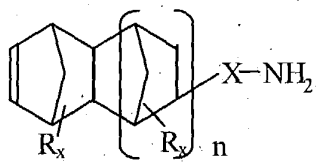
9. The heterobifunctional monomer according to claim 1, wherein Y is an itaconimide.

10. The heterobifunctional monomer according to claim 9, wherein the itaconimide is substituted with 1 or 2 independently selected lower alkyl, -Br, or –I.

11. A method for synthesizing heterobifunctional monomers according to claim 1, the method comprising contacting a primary amine with a defined reactant under cyclodehydration reaction conditions, thereby producing the desired heterobifunctional monomer,

wherein:

the primary amine has the structure:



each R is independently lower alkyl, -Br, or –I,

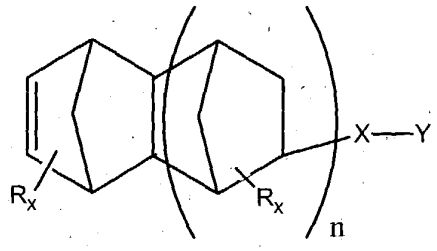
X is a covalent bond or a bridging group containing more than one carbon atom,

n is 0 to about 8, and

each x is independently 0, 1, or 2; and

the defined reactant is selected from optionally substituted maleic anhydride, a Diels-Alder adduct of maleic anhydride and cyclopentadiene, a methylene-dihydro-furan-2,5-dione, or an epoxy.

12. A heterobifunctional monomer of the following structure:



wherein:

each R is independently lower alkyl, -Br, or –I,

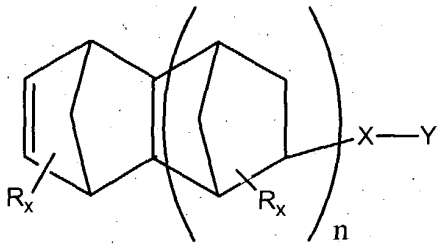
X is an optional bridging group,

Y is a nadimide, an itaconimide, an epoxy, a cyanate ester-substituted aryl, a propargyl-substituted aryl, an ethynyl-substituted aryl, a (meth)acrylate, an unsaturated anhydride, a vinyl ether, a vinyl ester, a divinyl compound, an allyl amide, a styrene, an oxazoline, or a benzoxazine,

n is 0 to about 8, and

each x is independently 0, 1, or 2.

13. A heterobifunctional monomer of the following structure:



wherein:

each R is independently hydrogen, lower alkyl, -Br, or –I,

X is an optional bridging group,

Y is a maleimide, a nadimide, an itaconimide, an epoxy, a cyanate ester-substituted aryl, a propargyl-substituted aryl, an ethynyl-substituted aryl, a (meth)acrylate, an unsaturated anhydride, a vinyl ether, a vinyl ester, a divinyl compound, an allyl amide, a styrene, an oxazoline, or a benzoxazine,

n is 0 or 2 to about 8, and

each x is independently 0, 1, or 2.

14. A polymer comprising a plurality of heterobifunctional monomers according to claim 1.

15. The polymer according to claim 14, wherein the norbornyl functional groups of the heterobifunctional monomers are polymerized.

16. The polymer according to claim 14, wherein the Y functional groups of the heterobifunctional monomers are polymerized.

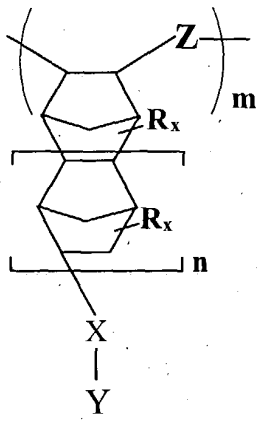
17. The polymer according to claim 14, wherein norbornyl functional groups of the heterobifunctional monomers are alternately polymerized with the Y functional groups of the heterobifunctional monomers.

18. A block copolymer comprising:

(a) one or more blocks of a plurality of polymerized heterobifunctional monomers according to claim 1, and

(b) one or more blocks of a polymerized comonomer selected from the group consisting of the heterobifunctional monomer, a maleimide, a nadimide, an itaconimide, an epoxy, a cyanate ester-substituted aryl, a propargyl-substituted aryl, an ethynyl-substituted aryl, a (meth)acrylate, an unsaturated anhydride, a vinyl ether, a divinyl compound, an allyl amide, a styrene, an oxazoline, or a benzoxazine, wherein the block(s) of (a) are different from the block(s) of (b).

19. A polymer having the structure:



wherein:

each R is independently lower alkyl, -Br, or –I,

X is an optional bridging group,

Y is a maleimide, a nadimide, an itaconimide, an epoxy, a cyanate ester-substituted aryl, a propargyl-substituted aryl, an ethynyl-substituted aryl, a (meth)acrylate, an unsaturated anhydride, a vinyl ether, a vinyl ester, a divinyl compound, an allyl amide, a styrene, an oxazoline, or a benzoxazine,

each Z is optionally present, and when present, is independently derived from any cationically polymerizable monomer, any free-radically polymerizable monomer, or any coordinatively polymerizable monomer,

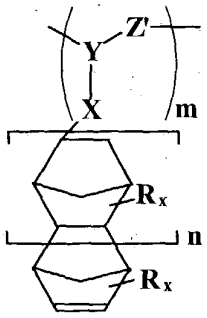
m is in the range of about 3 up to about 10,000,

n is 0 to about 8, and

x is 0 up to 2.

20. A polymer according to claim 19, wherein X is alkylene or oxyalkylene comprising up to about 20 carbon atoms, arylene, or siloxane.

21. A polymer having the structure:



wherein:

each R is independently hydrogen, lower alkyl, -Br, or –I,

X is an optional bridging group,

Y is a maleimide, a nadimide, an itaconimide, an epoxy, a cyanate ester-substituted aryl, a propargyl-substituted aryl, an ethynyl-substituted aryl, a (meth)acrylate, an unsaturated anhydride, a vinyl ether, a vinyl ester, a divinyl compound, an allyl amide, a styrene, an oxazoline, or a benzoxazine,

each Z' is optionally present, and when present, is independently derived from any cationically polymerizable monomer, any anionically polymerizable monomer, any free-radically polymerizable monomer, or any coordinatively polymerizable monomer,

m is in the range of about 3 up to about 10,000,

n is 0 to about 8, and

x is 0 up to 2.

22. A polymer according to claim 21, wherein X is an alkylene or oxyalkylene comprising up to about 20 carbon atoms, an arylene, or a siloxane.

23. A method for synthesizing a polymer according to claim 14, the method comprising subjecting a plurality of the heterobifunctional monomers to a Zeigler-type

coordinative reaction, a cationic cure, an anionic cure, a free radical ring opening or a ring-opening metathesis reaction.

24. A method for synthesizing a polymer according to claim 15, the method comprising subjecting a plurality of the heterobifunctional monomers to a Zeigler-type coordinative reaction, a cationic cure, or a free radical ring opening.

25. A method for synthesizing a polymer according to claim 16, the method comprising subjecting a plurality of the heterobifunctional monomers to an anionic cure.

26. A method for synthesizing a polymer according to claim 17, the method comprising subjecting a plurality of the heterobifunctional monomers to a free radical cure.

27. A method for synthesizing a polymer according to claim 18, the method comprising

(a) synthesizing a first block polymer by subjecting a first plurality of the heterobifunctional monomers to a Zeigler-type coordinative reaction, a cationic cure, or a free radical ring opening,

(b) synthesizing a second block polymer by subjecting a second plurality of heterobifunctional monomers to a free radical reaction, an anionic cure, or a UV catalyzed cationic cure, and

(c) subjecting a plurality of first and second block polymers to one or more of a Zeigler-type coordinative reaction, a cationic cure, an anionic cure or a ring-opening metathesis reaction.

28. A method for synthesizing a polymer according to claim 19, the method comprising subjecting a heterobifunctional monomer of claim 1 and a plurality of monomers Z to one or more of a Zeigler-type coordinative reaction, a cationic cure, an anionic cure, a free radical ring opening or a ring-opening metathesis reaction.

29. A method for synthesizing a polymer according to claim 21, the method comprising subjecting a heterobifunctional monomer of claim 1 and a plurality of monomers Z' to one or more of a Zeigler-type coordinative reaction, a cationic cure, an anionic cure, a free radical ring opening or a ring-opening metathesis reaction.

30. A thermoset resin comprising a polymer according to claim 14.

31. A thermoset resin comprising a polymer according to claim 15.

32. A thermoset resin comprising a polymer according to claim 16.

33. A thermoset resin comprising a polymer according to claim 17.

34. A thermoset resin comprising a polymer according to claim 18.

35. A thermoset resin comprising a polymer according to claim 19.

36. A thermoset resin comprising a polymer according to claim 21.

37. A thermosetting resin composition comprising:

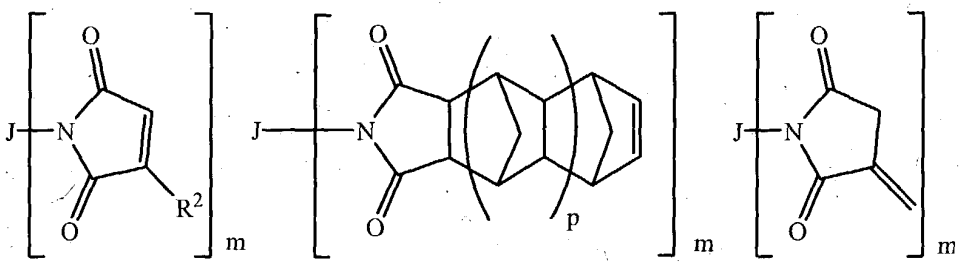
(a) a heterobifunctional monomer according to claim 1;

(b) in the range of 0.2 up to 5 wt % of at least one curing catalyst, based on the total weight of the composition

(c) optionally, at least one hydrophobic cyanate ester monomer, and

(d) optionally, at least one polycyclic olefin having at least one terminal norbornene functional group;

(e) optionally, at least one of a maleimide, a nadimide, or an itaconimide having, respectively the formulas **XIII**, **XIV**, and **XV**:



(XIII) **(XIV)** **(XV)**

wherein:

m = 1-15,

p = 0-15,

each R^2 is independently selected from hydrogen or lower alkyl, and

J is a monovalent or a polyvalent moiety comprising organic or organosiloxane radicals, and combinations of two or more thereof.

38. An assembly comprising a first article permanently adhered to a second article by a cured aliquot of the thermosetting resin composition according to claim 37.

39. An assembly according to claim 38, wherein the first article and the second article are separate layers of a laminated circuit board.

40. An article comprising a circuit board having a solder mask deposited thereon, wherein the solder mask is prepared from the composition according to claim 37.

41. An article comprising an electronic component encased within an aliquot of composition according to claim 37.

42. A polymer comprising a plurality of norbornyl-containing heterobifunctional monomers, wherein the polymer has one or more performance properties which render it suitable for use in the manufacture of electronic components, and wherein the performance properties are selected from the group consisting of

excellent moisture resistance, excellent ionic purity, low dielectric constant, good thermal properties, hydrophobic, high Tg, and low coefficient of thermal expansion.